CLAIMS

What is claimed is:

hemispherical image scene, comprising the steps of:

acquiring an omnidirectional image on an image plane using a reflective mirror that satisfies a single viewpoint constraint and an image sensor;

defining a perspective viewing window based on configuration parameters;

defining a predetermined geometric relationship between the reflective mirror and the image plane; and

mapping each pixel in the perspective window with a corresponding pixel value in the omnidirectional image on the image plane using the configuration parameters.

- 2. The method of claim 1, wherein the configuration parameters defined in the defining step include at least one of a zoom distance defined as the distance from the focal point of said reflective mirror to said window, a pan angle defined as the angle between the x axis and a line through the focal point of said reflective mirror perpendicular to the x-y plane and a tilt angle defined as the angle between the x-y plane and a vector normal to said window.
- 3. The method of claim 2, wherein the defining step is conducted via a user interface through which a user enters data corresponding to at least one of a desired zoom distance, pan angle, or tilt angle.
- 4. The method of claim 1, wherein the mapping step includes the step of generating a mapping matrix by:

applying a ray tracing algorithm to each pixel in the perspective viewing window to determine a corresponding reflection point on the reflective mirror; and

projecting each reflection point to a focal point of the image sensor to determine the corresponding location in the omnidirectional image on the image plane

- 5. The method of claim 4, further comprising the step of storing the mapping matrix in a module having a memory.
- 6. The method of claim 1 wherein the step of defining a perspective viewing window defines the perspective viewing window as a panoramic viewing window.
- 7. The method of claim 1, further comprising the steps of: calculating a residual image based on a difference between a reference omnidirectional image and a sequential omnidirectional image;

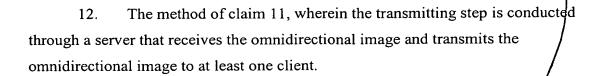
determining if the residual image contains any value that exceeds a predetermined threshold; and

classifying any value that exceeds the predetermined threshold as an anomaly.

8. The method of claim 7, further comprising the steps of: calculating the configuration parameters for the perspective viewing window from the anomaly; and

selectively focusing the perspective viewing window on the anomaly using the calculated configuration parameters.

- 9. The method of claim 7, further comprising the step of activating an alarm if at least a portion of the residual image exceeds a predetermined threshold.
- 10. The method of claim 1, further comprising the steps of:
 detecting a location of a sound source in the image scene; and
 adjusting the perspective viewing window based on the detected location of
 the sound source.
- 11. The method of claim 1, further comprising the step of transmitting the omnidirectional image via the Internet.



- 13. The method of claim 1, further comprising the step of forming a two-way transmission link between the image sensor and a remote display, wherein the two-way transmission link transmits at least one of the omnidirectional image, the perspective viewing window, and an audio signal.
- 14. An improved imaging apparatus for generating a two-dimensional image, comprising:

a reflective mirror configured to satisfy an optical single viewpoint constraint for reflecting an image scene;

an image sensor responsive to said reflective mirror and that generates two dimensional image data signals to obtain an omnidirectional image on an image plane; and

a controller coupled to the image sensor, wherein the controller defines a perspective viewing window and includes a mapping matrix generator that defines a geometric relationship between the image plane and the perspective viewing window such that at least a portion of the omnidirectional image on the image plane can be mapped to the perspective viewing window.

- 15. The improved imaging apparatus of claim 14, wherein the reflective mirror conforms to a single viewpoint constraint.
- 16. The improved imaging apparatus of claim 14, wherein the reflective mirror creates a one-to-one correspondence between pixels in the omnidirectional image and pixels in the perspective viewing window.
- 17. The improved imaging apparatus of claim 14, wherein the controller maps the omnidirectional image to the perspective viewing window by mapping each

pixel in the perspective viewing window with a corresponding pixel value in the omnidirectional image.

- 18. The improved imaging apparatus of claim 14, wherein the parameters defining the perspective viewing window include at least one of a zoom distance defined as the distance from the focal point of said reflective mirror to said window, a pan angle defined as the angle between the x axis and a line through the focal point of said reflective mirror perpendicular to the x-y plane and a tilt angle defined as the angle between the x-y plane and a vector normal to the perspective viewing window.
- 19. The improved imaging apparatus of claim 18, further comprising a user interface through which a user enters data corresponding to at least one of a desired zoom distance, pan angle, or tilt angle.
- 20. The improved imaging apparatus of claim 14, wherein the controller generates the mapping matrix by applying a ray tracing algorithm to each pixel in the perspective viewing window to determine a corresponding reflection point on the reflective mirror and then projecting each reflection point to a focal point of the image sensor to determine the corresponding location on the omnidirectional image.
- 21. The improved imaging apparatus of claim 14, wherein the perspective viewing window is a panoramic viewing window.
- 22. The improved imaging apparatus of claim 10, further comprising a module having a memory for storing the mapping matrix.
- 23. The improved imaging apparatus of claim 22, wherein the module is a display/memory/local control module.
- 24. The improved imaging apparatus of claim 14, wherein the controller calculates a residual image based on a difference between a reference omnidirectional image and a sequential omnidirectional image to detect an anomaly and uses the

anomaly to calculate parameters for the perspective viewing window so that the perspective viewing window focuses on the anomaly.

- 25. The improved imaging apparatus of claim 24, further comprising an alarm that is activated if at least a portion of the residual image exceeds a predetermined threshold.
- 26. The improved imaging apparatus of claim 14 further comprising an acoustic sensor coupled to the controller for detecting a sound source within the image scene, wherein the controller adjusts the perspective viewing window based on a location of the sound source.
- 27. The improved imaging apparatus of claim 14, further comprising an image transmission system for transmitting the omnidirectional image via the Internet.
- 28. The improved imaging apparatus of claim 27, wherein the image transmission device includes a server that receives the omnidirectional image and transmits the omnidirectional image to at least one client.
 - 29. The improved imaging apparatus of claim 10, further comprising: a remote display coupled to the image sensor;
 - a first speaker and first microphone coupled to the image sensor; and
- a second speaker and second microphone coupled to the remote display, wherein the first and second speakers and first and second microphones form a two-way transmission link between the image sensor and the remote display.